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PROVINCE OF ALBERTA
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The Selection and Seeding of Grasses and Legumes in Alberta

By
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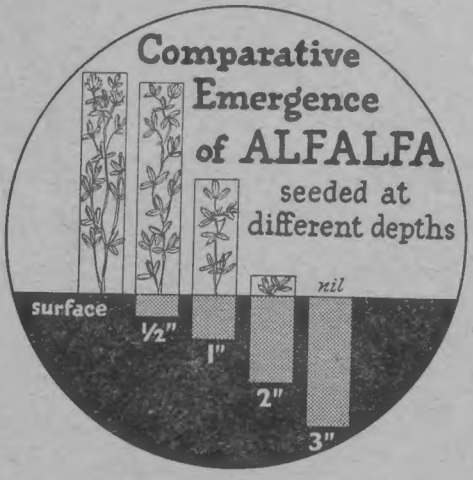

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Selection and Seeding of Grasses and Legumes in Alberta

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INTRODUCTION

Alberta is growing older as an agricultural area and the trend in most districts is toward a better balanced farm programme. Mixed farming is coming to the fore and the "get rich quick" attitude of the pioneer days is being replaced by a desire to build up more permanent farms and attractive farmsteads. This should naturally be followed by an appreciation of the fact that every farmer has a responsibility to maintain the productivity of his land for the benefit of future generations. This change is being accelerated by mounting losses from weeds and from erosion by wind and water. The growing tendency, especially in the grey wooded soils area, toward planning permanent farm rotations is another factor tending to change the pattern of farming.

These developments all involve the growing of grasses and legumes. Greater emphasis on forage crops has brought about a demand for information concerning the adaptation and production of different species in the various soil zones of the Province. This circular is prepared for use throughout the Province, consequently, while general principles will apply, local conditions should be taken into consideration. It deals mainly with the selection and seeding of grasses and legumes but the necessity for using fertilizers in conjunction with legumes on grey wooded soils is also recognized. The maintenance of yields, grazing and haying practices, and the production of seed are all increasing in importance but discussion of these points must be left to subsequent publications. For such information as may be required in the meantime it is suggested that farmers consult their District Agriculturists or one of the agricultural institutions which is at their service.

Grasses and Legumes Recommended

No single grass or legume can be recommended as definitely the best for all purposes in any particular agricultural region. Each specie has a range of adaptation and use which overlaps with those of other species. Because their moisture requirements are more definite, however, legumes are more restricted in range of adaptation than are the grasses.

The following tabulation sets out the chief characteristics and adaptations of the common grasses and legumes recommended for Alberta:

LEGUMES

Species	Adaptation	Root System	Uses*	Rate of Seeding: Lbs. per acre	Stage to cut for hay
Alfalfa	Wide adaptation; prefers moist but well drained soils.	Branching tap.	Hay; Pasture Mixtures.	8 to 10	1/10 to ½ bloom
Red Clover (Altaswede)	Adapted to grey-wooded and black soils.	Branching tap.	Hay. Short rotations.	7 to 8	Full bloom.
Sweet Clover	Wide adaptation; alkali resistant. clay soils.	Tap.	Hay and pasture, Short rotations.	8 to 12	Bud stage.
Alsike	Low lands and areas subject to flooding.	Branching tap.	Hay and pasture mixtures.	5 to 6	Full bloom.

GRASSES

Kind	Adaptation	Root System	Uses*	Rate of Seeding: Lbs. per acre	Stage to cut for hay
Brome	Widely adapted as to soil moisture conditions. Makes good growth throughout summer.	Creeping; fibrous.	Hay and pasture.	10 to 12	Early heading
Crested Wheat	Dry open plains. Sandy soils in humid areas. Early spring and late fall growth.	Bunch grass; densely fibrous.	Hay and pasture. Range reclamation.	6 to 10	Early heading
Timothy	Rich moist soils, and cool temperatures. Not alkali resistant. Short duration.	Bunch grass; fibrous.	Hay and pasture mixtures.	5 to 6	Blossom
Slender Wheat	Moist to dry lands, alkali resistant. Short duration.	Bunch grass; fibrous.	Hay mixtures.	10 to 12	Early heading
Kentucky Blue	Prefers abundant moisture. Makes heaviest growth in spring and fall.	Creeping; fibrous.	Pasture	5 to 6	
Creeping Red Fescue	Greater adaptability to dry conditions than Kentucky Blue.	Creeping; fibrous.	Pasture	6 to 8	
Reed Canary	Low areas with high water table.	Creeping; fibrous.	Hay and pasture.	6 to 8	Before heading
Red Top	Wet acid soils; not alkali resistant.	Creeping; fibrous.	Hay; Pasture mixtures.	4 to 6	Fully headed.

*Mixtures are mentioned in this tabulation only in the case of species which it is definitely recommended should not be seeded alone .

Considering production and feeding value, alfalfa must be rated the peer of all forage crops. Alfalfa will not withstand excessive moisture, but will do as well as any other legume under dry conditions. All legumes do especially well on our grey-wooded soils. Alsike is especially adapted to heavy soils and withstands flooding. Sweet clover, being a biennial, is suitable for short rotations.

Brome is the most widely adapted grass, but it prefers moderate to moist conditions. Crested wheat is recommended in the south-east part of the Province, and timothy in areas receiving plenty of moisture. The popularity of slender wheat grass has declined rapidly in late years, but should be used where alkali resistance is required. It will be noted that other grasses included in the tabulation have special adaptations.

Grass and Legume Mixtures

In selecting crops for hay or pasture, grasses and legumes should be chosen that are suitable for seeding in mixtures. Properly inoculated legumes in the mixture increase the value and quantity of feed produced and through the addition of nitrogen to the soil maintain soil fertility. Grasses in the mixture fill the soil with desirable root fibre, provide a combination for hay that is easier to cure than legumes alone, and, when in pastures, reduce the danger of loss in live stock through bloating.

Set out below are a few examples which indicate the grasses and legumes that mix or do well together. It should be pointed out, however, that the table is intended merely as a guide. To meet special conditions or requirements it is frequently advisable to make up combinations or mixtures which it would be impossible to give in detail. The table on characteristics and adaptations which is given on pages 2 and 3 should be consulted.

Suggested Mixtures of Grasses and Legumes

(In the tabulation below the quantity of seed indicated, is the amount of each kind it is recommended should be seeded per acre.)

Recommended for Pasture

1.	Alfalfa—3 lbs. Brome—7 lbs.	For permanent pasture, recommended for all but the driest parts of the Province. The proportion of alfalfa is low to reduce danger of bloating in live stock, but is sufficient to prevent an early development of sod-bound condition in brome.
2.	Alfalfa—3 lbs. Brome—4 lbs. Kentucky Blue Grass—2 lbs. or Creeping Red Fescue—3 lbs.	Creeping Red Fescue adapted to most soil conditions. Kentucky Blue suitable on rich moist soils.
3.	Brome—6 lbs. Kentucky Blue Grass—2 lbs. Alfalfa—2 lbs. White Dutch Clover ½ lb.	Recommended for pasture under irrigation. Blue grass will dominate the mixture in a few years.

Recommended for Pasture or Hay

1.	Alfalfa—2 lbs. Brome—3 lbs. Crested Wheat—3 lbs.	Recommended for drier areas. Brome might be omitted from the mixture and the quantity of crested wheat doubled.
2.	Alsike—2 lbs. Reed Canary Grass—2 lbs. Red Top—2 lbs.	Suited to wet locations subject to flooding.

Recommended for Hay

1.	Alfalfa—6 lbs. Brome—4 lbs.	Same adaptability as No. 1 pasture mixture. In seeding for hay it is possible to include a greater proportion of the legume, since there is little danger of the hay causing bloating in live stock.
2.	Alfalfa—6 lbs. Timothy—3 lbs.	Timothy is sometimes preferred to brome in rotations because it is more easily eradicated. This mixture is recommended where moisture conditions are good. Red or Alsike clover may replace part of the alfalfa.
3.	Red Clover—4 lbs. (Altaswede) Brome—3 lbs. Timothy—2 lbs.	On grey-wooded soils, or black soils well supplied with moisture.
4.	Alsike—2 lbs. Timothy—2 lbs. Brome—4 lbs.	In wet locations subject to flooding. If very wet, discard brome and add 1 lb. to rate of seeding each of alsike and timothy, or add 2 lbs. red top.

Mixtures are recommended that consist of one or more grasses and legumes. Alfalfa and brome, which form the base of a widely grown mixture, have similar habits with regard to moisture conditions and general adaptation. To meet special conditions or variability in a field, other species may be added. In areas that receive limited rainfall, the brome might be reduced, and crested wheat grass added; while in the moist parts of the Province, a number of grasses and legumes will increase the value of the mixture. Note especially that in the grey-wooded areas, a mixture for hay should include red clover (Altaswede). In fact, in the areas to which it is adapted red clover might supplant alfalfa entirely in short rotations.

The second type of mixture which should be mentioned consists of alsike clover and timothy. This mixture is adapted where abundance of moisture and cool temperatures prevail and on lands subject to flooding. As in the case of alfalfa and brome mixtures the addition of other similarly adapated species may increase the quantity and value of forage produced.

Up to four pounds of sweet clover might be added in some districts and the quantity of seed of other species only slightly reduced. Since sweet clover is a biennial, it will disappear after the second year unless allowed to re-seed. It is particularly useful on land containing too much alkali to permit the production of alfalfa. Sweet clover is commonly grown on heavier soils to be plowed under as a green manure crop.

Finally it should be pointed out that in practice the availability and price of seed will determine to some extent the forage species which shall be included in a mixture. If high yields of good forage are to be obtained, however, the use of grasses and legumes that are adapted and associate well together should be selected. This is especially important when the field seeded down is to be left in permanent hay or pasture. The object should be to utilize to the best advantage the land which is devoted to the production of these crops.

Seeding Forage Crops

Success or failure in securing satisfactory stands of grasses and legumes is determined largely by the treatment given in the first year.

It should be emphasized that care in the preparation of the soil, seeding, etc., is doubly important when seeding a crop that is to remain in the production of forage for a number of years. Alfalfa is usually left down as long as it can be maintained in a productive state. In addition the price of alfalfa seed is relatively high. For these reasons the failure of an

attempt to establish a good stand will result in considerable loss. Carelessness with respect to any farm practice should not be invited, but extreme care may not be warranted when seeding a short rotation crop such as sweet clover, the seed of which is relatively cheap.

Preparation of the Soil

Shallow seeding in firm soil is important if satisfactory stands of grasses and legumes are to be secured. Prepare the soil, whether fallow or stubble, by shallow cultivation, and then pack. Under no circumstances should cultivation be deep immediately before seeding.

Should the land be heavily infested with perennial weeds, it is advisable to fallow a full year previous to seeding. Seeding into clean stubble is satisfactory, provided conditions permit preparation of a seed bed by shallow cultivation. Indeed, stubble seeding is recommended in areas subject to soil drifting, since trash left on the surface will protect the young seedlings against the wind and drifting soil particles. The soil surface should be level and free from stones, roots, etc., for convenience in harvesting hay crops.

Time of Seeding

There is a wide range in the time at which forage seeds may be planted. In the south it is important that spring seeding be done early, especially in the case of crested wheat grass. Good stands of grasses are also secured in this area by seeding during the first two weeks in September or immediately before freeze-up. In areas of greater rainfall, as in the black and wooded soil zones, spring seeding may be delayed until the middle of June.

Do not seed in the spring or early fall unless there is sufficient moisture at the depth of planting to germinate the seed. It is better to keep the seed in the sack than to sow in loose, dry soil. Wait until after a good rain, even if it does not come until the first of July, or, if in the south, wait until fall.

Forage crops should not be sown on land infested with cutworms until the worms are fully grown. This is usually not before the middle but may be as late as the end of June.

Method of Seeding

Under most circumstances seeding with a grain drill rather than broadcasting is recommended. Under dry conditions, the results from broadcast seeding may be disappointing. However, when drilling in grass or legume seed, care should be taken to firm the land sufficiently to permit shallow seeding.

If available, a grass seeder or fertilizer attachment should be used. Well cleaned crested wheat grass can be seeded alone from the grain box of the drill; but when seeding practically all other grasses and legumes this way, it is preferable to mix the seed with twice its bulk of cracked wheat from which the floury part has been sifted.

When a nurse crop is used, it is advisable to seed the grain first and then immediately drill in the forage crop cross-wise. The latter may be planted too deeply if sown with the grain. If grasses and legumes must be seeded at the same time as the grain, they should be broadcast from a seeder attachment behind the drill discs and in front of cover chains.

A cyclone or wheelbarrow seeder will most effectively and evenly distribute forage seed when the operation must be performed by hand.

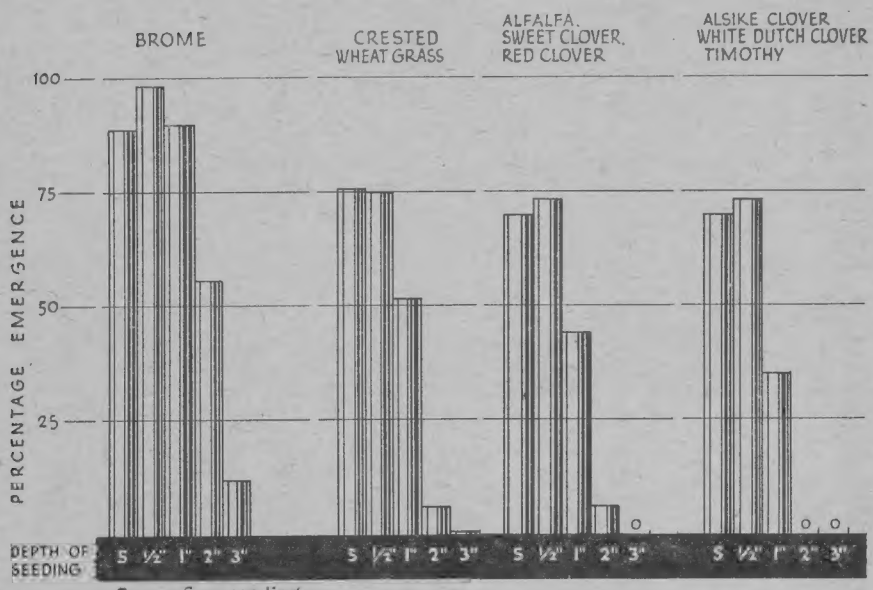
Some method of packing the soils should follow seeding operations. Firmly packing the seeds in the soil close to moisture will ensure good germination. However, on some soils care must be taken lest packing results in baking of the surface and preventing the emergence of seedlings. If the seed is broadcast, a cultipacker will assist to cover the seed as well as to pack the soil.

Depth of Seeding

Grasses and legumes must be seeded shallowly if satisfactory stands are to be obtained. This is demonstrated in a chart presented herewith, showing the percentage emergence of a number of common forage seeds planted at different depths.

EMERGENCE OF GRASS AND LEGUME SEEDLINGS AT DIFFERENT DEPTHS OF PLANTING

(Emergence of kinds showing similar results averaged)



While large seeds such as brome and slender wheat grass may be seeded about one inch deep, small grass seeds and the legumes should not be seeded more than one-half inch in depth.

Use of a Nurse Crop

On the brown soils and the drier parts of the black soil zone of the Province, grasses and legumes should not be seeded with a nurse crop. The use of a nurse crop in these areas greatly reduces the chance of securing a satisfactory stand.

In areas receiving greater precipitation a lightly seeded grain crop may be used as a nurse crop without greatly endangering the succeeding stand of forage. There is some risk involved, however, and it is usually considered advisable to seed alfalfa without a nurse crop. Alfalfa seed is expensive and a stand not as easily established as with some other species.

If the land is not weedy, flax is the best of all nurse crops because it does not shade the land as cereals do. Other satisfactory nurse crops are early varieties of barley and oats seeded at not more than one-half the usual rate. If later varieties are used they should be seeded at about one-half bushel per acre and cut for green feed. The aim should be to have a thin stand of grain and leave it on the land as short a time as possible.

Inoculation of Legumes

Legumes increase the nitrogen content of the soil when inoculated with the proper nodule-forming bacteria, which have the power to "fix" nitrogen contained in the air. Legumes cannot obtain nitrogen from the air except through the action of these bacteria and if seeded without them actually draw upon the reserve of nitrogen in the soil. No legume should be seeded without inoculation. Cultures are easy to apply and the cost is low.

There are several kinds of legume bacteria, each capable of inoculating a special group of legumes. Farmers producing forage crops in Alberta are interested in two of these groups: (1) the alfalfa group which is also used for inoculating white sweet clover and yellow sweet clover; and (2) the red clover group which is capable of inoculating Mammoth and Alta-swede red clovers, alsike and white Dutch.

Moist humus inoculating cultures have taken the place of the jelly type cultures formerly used. These are effective and convenient to apply. Manufacturers are now putting out "double seeded" cultures. These contain two kinds of bacteria; one capable of inoculating the alfalfa group of legumes and the other the red clover group. These combined cultures are convenient and give good results.

Use of Commercial Fertilizers

A permanent and successful type of agriculture cannot be established on the grey-wooded soils unless a crop rotation which includes legumes is adopted. However, legumes require the application of commercial fertilizers to produce satisfactory stands. So important is the use of fertilizers in legume production on grey-wooded soils that yields are commonly more than doubled by their application. Sulphur and nitrogen are the main elements lacking in these soils. The Nitrogen may be added by growing legume crops but the sulphur must be supplied in commercial fertilizer.

A list of some of the fertilizers recommended for use in forage crop production on grey-wooded soils is as follows:

	Recommended rate of application
Ammonium Sulphate	40-60 pounds per acre.
Ammonium Phosphate 16-20	40-60 pounds per acre.
Ammonium Phosphate 2-19	60-90 pounds per acre.
Gypsum	60-100 pounds per acre.

The first three of the fertilizers mentioned may be sown through an ordinary fertilizer attachment—the others must be spread by hand. A satisfactory practice is to broadcast the fertilizer as a top dressing in the early spring.

Commercial fertilizer applied to forage crops on the brown and black soils in Alberta has not given consistent increases in yields and cannot be generally recommended. Farmers contemplating the use of fertilizers on these soils, therefore, would be well advised to make preliminary small scale tests on their own farms.

Barnyard manure, if well rotted and evenly applied, is a valuable fertilizer but is frequently not available in sufficient quantities to meet requirements.